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CALENDAR CORRECTOR

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The present invention relates to timepieces that display the calendar. It relates more specifically, 5 based on the same principle, to a manual calendar corrector mechanism for a simple calendar and to an automatic calendar corrector mechanism for a perpetual calendar.

10 In a watch, the calendar mechanism allows the date of the month to be indicated by means of a hand moving over the dial or by means of a disk rotating under the dial and showing its information through a window. This kind of system is well known to those skilled in the 15 art and is described in detail, for example, in the work entitled "Théorie de l'horlogerie" by Reymondin et al., Fédération des Ecoles Techniques, 1798, ISBN 2-940025-10-X, pages 189 et seq.

20 It will be recalled that the calendar indicator, whether a disk or a hand, is actuated off the hours wheel, via the calendar gear-train the last element of which is a thirty-one wheel performing one revolution in thirty-one days by advancing by one step of $360/31^\circ$ 25 every twenty-four hours, at around midnight. In the case of a display using a hand, the hand is mounted so that it rotates as one with the shaft of this wheel. In the case of a display using a disk, this disk is driven by a finger integral with the thirty-one wheel.

30 For months comprising fewer than thirty-one days it is necessary, in the case of simple calendars, to make a manual correction. This operation can be performed either by rotating the winding stem in its quick date-setting position or by actuating a push-button fitted freely into the watch case middle. Of course, the 35 operation has to be performed on the last day of a month comprising fewer than thirty-one days or on the first day of the next month.

In order to avoid the user having to perform such updates, various mechanisms, known as perpetual calendars, have been developed. They automatically adapt to the length of the months, sometimes even predicting leap years. A toothed wheel, known as a cam, has hollows the depths of which are correlated to the length of the months. Schematically speaking, the cam comprises forty-eight or twelve sectors, depending on whether or not the mechanism takes account of leap years. A complex assembly of several other cams and levers, one of which is equipped with a nose collaborating with the first cam, transmits to the thirty-one wheel the order to jump by one, two or three days at the end of a thirty-day, a twenty-nine-day or a twenty-eight-day month, respectively.

The initial object of the present invention is to propose a simple calendar corrector allowing the correction in the display of the date to be programmed simply on any day of a month comprising fewer than thirty-one days so that the correction is actioned on the last day.

More specifically, it relates to a simple calendar corrector intended to fit in a movement of a timepiece equipped with calendar-display means and with a thirty-one wheel that makes one revolution in thirty-one days. This corrector comprises:

- manual control means allowing information relating to the fact that the month in progress comprises fewer than thirty-one days to be input, and
- programming means comprising a clutch runner equipped with two coaxial toothed disks, namely a first disk that can be rotationally driven in a first direction by the thirty-one wheel and a second disk that can be rotationally driven in a second direction, the opposite to the first, by the control means, so that, at the end of the

month in progress, the display means are automatically corrected.

The second object of the invention is to provide a
5 perpetual calendar mechanism devoid of the customary cams and levers.

In order to achieve this second object, the perpetual calendar corrector according to the invention
10 comprises:

- automatic control means which, during each month comprising fewer than thirty-one days, produce information relating to the correction that will have to be made at the end of said month, and
- 15 programming means comprising a clutch runner equipped with two coaxial toothed disks, namely a first disk that can be rotationally driven in a first direction by the thirty-one wheel and a second disk that can be rotationally driven in a second direction, the opposite to the first, by the control means, so that, at the end of the month in progress, the display means are automatically corrected.

25 In both instances, whether in the case of a simple calendar or of a perpetual calendar, the disks are coupled together by a spring and by a system of pawls which are arranged in such a way that:

- the first disk rotates in the first direction independently of the second,
- the second disk drives the first when it rotates in the first direction, and
- the second disk does not drive the first when it rotates in the second direction, at that time merely loading said spring.

Furthermore, the programming means comprise:

- a finger fixed to the thirty-one wheel,

- a first lever pivotably mounted on the second disk and that can be actuated by said finger on the last day of the month, and
- a second lever mounted independent of the clutch 5 runner, that can be actuated by the first lever when the latter is moved by the finger, immobilizing the second disk and releasing it when actuated in such a way that, subjected to the action of said spring, the first disk progresses 10 rapidly in order to correct the calendar display.

Other characteristics of the invention will become more clearly apparent from reading the description which follows, with reference to the attached drawing in 15 which:

- figures 1 and 3 are views from above of the simple corrector according to the invention, at the end of thirty-one-day and twenty-eight-day months respectively,
- figure 2 is a view in cross section of the mechanism of figure 1, and
- figure 4 is a view from above of the perpetual calendar mechanism at the end of a thirty-day month.

The mechanism according to the invention is intended to fit in the movement of a mechanical or electro-mechanical watch with calendar display. As the realization of this function is perfectly well known to 30 those skilled in the art and does not specifically form part of the invention, it will not be described in detail.

Figures 1 to 3 depict a thirty-one wheel 10 rotating in 35 the clockwise direction (hereinafter CWD) at a rate of one revolution in thirty-one days. It bears, fixed to its shaft 11:

- a hand 12 indicating the date on a series of numerals ranging from 1 to 31, written on a dial 13, and
- a finger 14 the length of which exceeds the radius of the wheel 10.

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The essential component in the mechanism is a clutch runner with pawls 15, comprising two coaxial toothed disks, a lower one 16 and an upper one 17. The lower disk 16 meshes with the thirty-one wheel 10 and therefore rotates in the counterclockwise direction (hereinafter CCWD). The upper disk 17 is driven in the CWD by a push-piece 18 protruding from the watch case middle to form a button 19 accessible to the wearer of the watch. Pressing the button 19 causes the disk 17 to move on by one step, that is to say by $360/31^\circ$, then a spring 20 returns the push-piece 18 to its initial position.

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The runner 15 is provided, according to a construction well known to those skilled in the art, with pawls and with a spring which are positioned between the two disks 16 and 17 but which are not visible in the drawing. The lower disk 16 thus rotates in the CCWD independently of the upper disk 17 which drives the disk 16 only when it rotates in the CCWD but not when it rotates in the CWD, in such circumstances merely loading the spring.

A first lever 22, known as the small lever, is pivotably mounted about a spindle 23 on the upper face of the upper disk 17. It consists of two arms 22a and 22b typically making an angle of about 120° between them and facing, the first (22a) toward the inside and the second (22b) toward the outside of the disk. The outer arm 22b is normally held pressed against a stop 24 positioned at the periphery of the disk 17 by a spring (not depicted), while its end lies flush with the edge of the disk. It will be noted, as shown by

figure 2, that the small lever 22 is at the same level as the finger 14 of the thirty-one wheel 10.

The mechanism comprises a second lever 25, known as the
5 big lever, which pivots about a spindle 26 riveted to the plate. This lever is roughly L-shaped. Its short arm 25a is positioned at the upper disk 17 and ends in a lug 27 that a jumper 30 presses against the toothset of the disk so as to prevent it from rotating in the
10 CCWD. The long arm 25b of the big lever 25 is arranged on the upper disk 17 and provided with a shoulder 28 designed in such a way as to take the thrust of the short arm 22a of the small lever 22. The long arm 25b ends in a boss 29 intended to experience the action of
15 a safety block 31 riveted to the upper face of the disk 17 when the latter pivots in the CWD.

Advantageously, the series of numerals 28, 29, 30, 31
is written onto a portion of the periphery of an
20 indicator disk 32 fixed to the shaft of the upper disk 17, above the latter. A window 33 made in the dial 13 reveals one of the numerals in the series, depending on the position of the disk 17. The usefulness of this
25 indicator system will become more clearly apparent on reading the remainder of the description which explains how the mechanism according to the invention works.

In the course of a thirty-one-day month, there is no need to correct the calendar display. The thirty-one
30 wheel 10 rotates the lower disk 16 of the clutch runner 15 in the CCWD, without that having any effect because the upper disk 17 is held immobile by the lug 27 and by the pressure of the jumper 30 on the short arm 25a of the big lever 25. The indicator disk 32 is then
35 positioned in such a way that the numeral 31 of the series on the disk 32 appears through the window 33.

As the wheel 10 turns, the date display hand 12 performs its function in the normal way and the finger

14 moves over the upper disk 17 without its travel meeting the small lever 22.

During a twenty-eight-day month of February it is
5 necessary to make a correction of three steps so that,
on the twenty-eighth day of the month, at around
midnight, the hand 12 skips the days 29, 30 and 31 and
directly indicates the first day of the month of March.

- 10 In order to do this, on the day of his choosing during
the month of February, the user presses three times in
succession on the button 19 part of the push-piece 18,
and this has the effect of rotating the upper disk 17
in the CWD by an angle of 3 times $360/31^\circ$. The lower
15 disk 16 does not rotate but the spring of the runner 15
becomes loaded. The big lever 25 prevents the disk 17
from returning in the CCWD under the effect of the
spring of the runner 15. Of course, as figure 3 shows,
the small lever 22 and the safety block 31 are brought
20 closer to the point of meshing of the thirty-one wheel
10 and the clutch runner 15. It is important to note
that the long arm 22b of the small lever 22 is now in
the path of the finger 14. More specifically, it is
positioned in such a way as to meet it at the moment
25 when the date indicator hand 12 moves on from the
twenty-eighth to the twenty-ninth day. The numeral 28
in the series 28, 29, 30, 31 on the disk 32 then
appears through the window 33.
- 30 When, on the twenty-eighth day of the month, at around
midnight, the thirty-one wheel 10 moves on by one step,
the finger 14 comes into contact with the long arm 22b
of the small lever 22 and causes it to pivot about its
spindle 23. The short arm 22a then presses against the
35 shoulder 28 of the big lever 25, applying pressure
greater than that exerted by the jumper 30. The big
lever 25 pivots and the lug 27 breaks contact with the
toothset of the upper disk 17.

Thus released, the upper disk 17 skips three steps in the CCWD, moved by the spring which suddenly unloads. At the same time it drives the lower disk 16 which meshes with the thirty-one wheel 10. The latter and the date indicator hand 12 therefore also skip three steps in the CWD.

The hand 12 then indicates the first day of the month of the series inscribed on the dial 13. The numeral 31 10 in the series on the indicator disk 32 shows again through the window 33.

For twenty-nine-day or thirty-day months, the mechanism works in the way that has just been described but the 15 user presses twice or once on the button part 19 of the push-piece 18 in order thus to cause the upper disk 17 to move on by two steps or by one step, respectively.

There is no situation in which it is necessary to 20 modify the calendar display by four days. Thus, were the wearer to press the push-piece 18 four times, the display will be one or more days out when moving on to the first day of the month. In addition, it could be inappropriate to apply excessive stress to the spring 25 of the runner 15.

In order to circumvent these problems, when three corrections have been made, as in the example set out hereinabove, the safety block 31 lies at the base of 30 the boss 29 of the long arm 25b of the big lever 25. Further pressure on the push-piece 18 causes the upper disk 17 to rotate by an additional step in the CWD and the block 31 pushes the boss 29 by applying a pressure greater than that exerted by the jumper 30. The big 35 lever 25 in its turn pivots and the lug 27 breaks contact with the toothset of the upper disk 17, allowing the spring of the runner 15 to return to its rest position.

Thus, a calendar corrector mechanism is proposed that allows the correction that needs to be made to be programmed on any day of a month comprising fewer than thirty-one days, the correction being actioned on the 5 last day of the month, at around midnight.

In order to avoid the user having to make the corrections himself, the present invention finds a second application in a perpetual calendar mechanism, 10 illustrated in figure 4, which automatically takes account of the number of days in the various months.

This mechanism again includes:

- the thirty-one wheel 10,
- the clutch runner with pawls 15,
- the small lever 22 and its stop 24,
- the big lever 25 and its jumper 30, and
- the indicator disk 32.

20 These various elements are arranged in the way described previously but, this time, the upper disk 17 is no longer driven by a push-piece.

The mechanism in figure 4 is set out in a simplified 25 version that does not account for leap years. It comprises a months wheel 40 divided into twelve sectors 41 each corresponding to one month of the year. Each of these sectors 41 is either devoid of teeth, if identified with a thirty-one-day month or equipped with 30 one tooth 42 in the case of thirty-day months, or equipped with three teeth 42 in the case of the month of February. These teeth 42 are positioned in a way that will be explained later on.

35 The teeth 42 are in mesh with an intermediate runner 43, itself meshing with the upper disk 17 of the clutch runner 15. The toothsets of these various runners have identical pitches, which means that an advance of the

wheel 40 by one step causes the same advance of the disk 17.

A months star 44 with twelve branches 45 is mounted coaxial to and rotating as one with the months wheel 40. Each branch 45 corresponds to one month of the year. The star 44 is positioned by a jumper 46 with two inclined planes, so that, for example, when the tooth 42a of the sector 41a of the month of April of the wheel 40 is in mesh with the runner 43, the branch 45a of the month of April is in the path of a finger 47 mounted on the shaft of a second thirty-one wheel 48. The latter is identical to the first thirty-one wheel 10 and meshes with it. The length of the finger 47 exceeds the radius of the wheel 48.

In operation, the first thirty-one wheel 10 rotates in the CWD and drives, in the CCWD, on the one hand, the second thirty-one wheel 48 and, on the other hand, the lower disk 16 of the clutch runner 15 without having any other impact.

For a thirty-one-day month, the finger 47 is positioned in such a way as to lie flush with the branch 45b of the months star 44 corresponding to this month, preferably the first day of the month. Then, when, on this first day, at around midnight, the thirty-one wheel 10 and therefore the wheel 48 and the finger 47 move on by one step, this finger pushes the branch 45b and drives the star 44 and the months wheel 40 by one step in the CWD. Henceforth, they are in position ready for the next month.

The wheel 40 and the star 44 rotate in two phases. First of all, rotation is slow when the branch 45c pressed against the jumper 46 raises it by sliding along its first inclined plane. Rotation is then quicker, when this branch arrives on the second

inclined plane. The pressure then exerted by the jumper
46 accelerates the movement of the star.

The sector 41b of the months wheel 40 corresponding to
5 a thirty-one-day month has no teeth and therefore does
not drive the intermediate runner 43, even though it
faces it as the wheel rotates. The upper disk 17 of the
clutch runner 15 therefore does not move either and no
movement is transmitted to the thirty-one wheel 10.

10 As in the case of the manual corrector set out
hereinabove, the indicator disk 32 shows, through the
window 33, the numeral 31 corresponding to the number
of days that the month comprises.

15 For a thirty-day month, the finger 47 lies flush with
the branch 45a of the months star 44 corresponding to
this month, also the first day of the month. Then,
when, at around midnight, the thirty-one wheel 10 and
20 therefore the wheel 48 and the finger 47 move on by one
step, this finger pushes the branch 45a and drives the
star 44 and the months wheel 40 in the CWD.

25 The teeth 42 of the months wheel 40 and, more
specifically, the tooth 42a of the sector 41a
corresponding to this thirty-day month are positioned
in such a way as to drive the runner 43 in the CCWD
during the rapid phase of the rotation of the star 44.
The latter, in its turn, causes the upper disk 17 of
30 the clutch runner 15 to rotate by one step in the CWD,
loading its spring but without driving the lower disk
16. The small lever 22 is now positioned in such a way
that its long arm 22b comes into contact with the
finger 14 on the thirtieth day of the month at around
35 midnight. The numeral 30 featuring on the indicator
disk 32 appears through the window 33.

In the manner of that which occurs in the case of the
manual corrector set out hereinabove, the big lever 25

prevents any rotation of the upper disk 17 in the CWD. On the thirtieth day of the month at around midnight when the finger 14 moves on by one step, it comes into contact with the long arm 22b of the small lever 22 which pivots and pushes the long arm 25b of the big lever 25. This lever rotates in its turn and releases the upper disk 17. It then jumps by one step in the CCWD, moved by the spring of the clutch runner 15 which suddenly unloads and at the same time drives the lower disk 16. The thirty-one wheel 10 and the date indicator hand 12 therefore also skip a step in the CWD. The hand 12 therefore indicates the 1st day of the month on the series inscribed on the dial 13 and the numeral 31 of the series on the disk 32 once again appears through the window 33.

For twenty-eight-day or twenty-nine-day months of February, the mechanism works in the way just described, but the months wheel 40 causes the intermediate runner 43 to turn and therefore advances the upper disk 17 by three or by two steps.

In order for the abovedescribed mechanism to take account of leap years, the person skilled in the art will have no difficulty in adding a system, known as a Maltese cross system, to the months wheel 40. Thus, the sector corresponding to the month of February exhibits, once every four years, two teeth causing the date indicator hand 12 to skip two steps at the end of the twenty-nine-day month.

Obviously, the months wheel is able to display the current month by means, for example, of an indicator hand mounted on its shaft and pivoting on a small dial.

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The above description has been given merely by way of example and does not restrict the scope of the invention. It may easily be adapted to a calendar display mechanism employing disks, these being driven

by a transmission gear train from the thirty-one wheel
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Likewise, various solutions can be used to display the
5 number of days programmed for the month. For example, a
green region inscribed on the upper disk and occupying
an angle of $360^\circ/31$ may travel under the dial. It can
be seen through holes corresponding to the positions
occupied by this green region when the corrections have
10 been made in respect of the months comprising 28, 29,
30 or 31 days. The portions adjacent to the green
region are advantageously red in color to signal
clearly that the numerals in the series 28, 29, 30, 31
to which the red corresponds do not indicate the number
15 of days in the current month.

In another, even simpler, solution, a hand mounted to
rotate as one with the shaft of the upper disk 17
indicates, on a portion of the dial, the number of days
20 that the month in progress should contain, according to
the actual status of the corrector.